

other birds, this section including also a contribution on the anatomy of Hummingbirds by Mr. Frederic A. Lucas (pp. 290-294, pl. xv, and figs. 1-4). Under 'Variations' are described and profusely illustrated the wide range of external structure, as affecting the general size, the form and structure of the bill (figs. 5-14), the wing (figs. 15-25), and the tail (figs. 26-29, and pls. xvi-xxiv, in all 45 figures), and also the head and throat ornaments, etc., (Figs. 30-46, and pls. xxvi-xxxiv). By means of the copious illustrations a very good idea is conveyed of the very diverse forms of structure of bill, wings, tail, and head ornaments present in the various groups of this exceptionally numerous and diversified family. A few pages are given to 'Colors of the Plumage,' and 'Cause of the Changeable Hues of Humming Birds,' with brief descriptions of some of the more brilliantly colored species.

The last half of the paper (pp. 312-383) is devoted to 'Humming Birds of the United States.' These number seventeen species, of which only seven can be considered as characteristic of the region, the other ten either barely crossing our border or being of purely casual occurrence. The 'Key to the Genera' given, however, includes all of the genera found in Mexico, Cuba, and the Bahamas, as well as in the United States, being in fact an 'adaptation' of that given in the same author's 'Manual of North American Birds.' Uncolored original figures are given (pls. xxxv-xlvi) of thirteen of the species, including *Trochilus violajugulum* Jeffries, and *Selasphorus floresii* Gould, the former known only from the type, the other "accidental near San Francisco, California," and known only from this and one other specimen, the latter from Bolaños, Mexico.

Detailed descriptions are also given of several species wrongly attributed to North America, namely: *Lampornis nigricollis* (Vieill.), a South American species attributed to Florida by Audubon; *Atthis heloisa* (L. & DeL.), of Eastern Mexico, wrongly attributed to El Paso, Texas, through misidentification of a young example of *Stellula calliope*; and *Agyrtria tobaci* (Gm.), of northern South America, supposed (in all probability erroneously) to have been taken at Cambridge, Mass.

A vast amount of general information about Hummingbirds is thus brought together, in addition to an elaborate and very detailed account of those occurring north of the West Indies and Mexico, with some account of their nearest congeneric allies found in the contiguous regions to the southward.—J. A. A.

Merriam on the Life Areas of North America.—In his recent Presidential Address before the Biological Society of Washington Dr. Merriam* resumes consideration of the geographic distribution of life in North America, a subject already treated by him at some length in 'North Amer-

* The Geographic Distribution of Life in North America with Special Reference to the Mammalia. Annual Presidential Address, delivered at the Twelfth Anniversary Meeting of the Biological Society of Washington, February 6, 1892. By C. Hart Merriam, M. D. Proc. Biol. Soc. of Washington, Vol. VII, pp. 1-64, with map. April, 1892.

ican Fauna' (No. 3, Sept. 1890, and No. 5, Aug. 1891. See Auk, VIII, pp. 95-98). In this paper he gives (after a few pages of introductory remarks) a general historical review of the subject (pp. 6-21), followed by an extended discussion of the 'Life Regions and Zones of North America' (pp. 21-38), and closing with an exposition of the 'Causes controlling Distribution,' including 'Remarks respecting some of Wallace's Fallacies' (pp. 39-64). The historical synopsis of the proposed faunal and floral divisions of North America gives, in tabular form, the views of 56 different writers on the subject, ranging in date from 1817 to 1891, of whom 31 were zoölogists and 25 botanists. From this synopsis it appears "that a number of zoölogists and botanists, basing their studies on widely different groups, and as a rule ignorant of the writings of their predecessors, have agreed in the main in the recognition of at least seven (7) life areas in extratropical North America, namely: (1) an *Arctic area* north of the limit of tree growth; (2) a *Boreal transcontinental coniferous forest region*; (3) an *Atlantic or Eastern wooded region*, stretching westward from the Atlantic to the Great Plains; (4) a *Central or Middle region* reaching from the Plains to the Sierra Nevada and Cascade Mountains; (5) a *Pacific or Californian division*, covering the area between the east base of the Sierra and the Pacific Ocean; (6) a *Louisianian or Austroriparian division*, comprising the South Atlantic and Gulf States south of latitude 36°; (7) a *Sonoran division*, occupying the high table land of Mexico and stretching northward over the dry interior far enough to include the southern parts of California, Nevada, Arizona, New Mexico, and Texas" (p. 21). In addition to this it has of late been the custom of zoölogists, or more particularly ornithologists, to subdivide the eastern portion of North America into a series of lesser divisions or faunas, as (1) the Arctic, (2) the Canadian, (3) the Alleghanian, (4) the Carolinian (5) the Louisianian, and (6) the Floridian.

Dr. Merriam's investigations have led him to adopt a somewhat different classification, which may be presented in tabular form somewhat as follows :

I. BOREAL REGION.

1. *Arctic Division.*
2. *Boreal Coniferous Forest Region.*
 - a. Hudsonian Zone.
 - b. Canadian Zone.
 - c. Timber-line Zone.

Neutral or Transition Zone.

II. SONORAN REGION.

1. *Upper Sonoran Zone.*
 - a. Humid Upper Sonoran.
 - b. Arid Upper Sonoran.
2. *Lower Sonoran Zone.*
 - a. Humid Lower Sonoran.
 - b. Arid Lower Sonoran.

III. TROPICAL REGION.

The Boreal Region, as defined by Dr. Merriam, "extends obliquely across the entire continent from New England and Newfoundland to Alaska and British Columbia, and from about latitude 45° north to the Polar Sea," the southern border, however, receding northward "to about latitude 54° on the plains of the Saskatchewan." It extends southward in three long arms down the "three great mountain systems of the United States—an eastern arm in the Alleghanies, a central arm in the Rocky Mountains, and a western arm in the Cascades and Sierra Nevada." This latter bifurcates, "the main fork following the lofty Cascade and Sierra ranges to about latitude 36° , the other following the coast, gradually losing its distinctive characters . . . until it disappears a little north of San Francisco" (pp. 22, 23). It is divided into (1) an Arctic division, and (2) a Boreal Coniferous Forest division (p. 24). The Arctic division corresponds to the 'Arctic Realm,' 'Arctic Region,' 'Arctic Province,' etc., of nearly 30 previous writers on the subject, of whom about three fourths have accorded it a rank of the first class, and about one fourth as a region of the second class or grade, as is done by Dr. Merriam. The Boreal Coniferous Forest division is about equivalent to the Hudsonian and Canadian faunas (of most recent writers) combined, with their extension westward to the Pacific coast. These subdivisions are referred to by our author as forming "at least two transcontinental zones," called by him respectively 'Hudsonian Zone' and 'Canadian Zone'; he also says "a third or Timberline Zone may be differentiated from the Hudsonian proper" (p. 24).

The Sonoran Region is described as stretching "across the continent from Atlantic to the Pacific, covering nearly the whole country south of latitude 43° and reaching northward on the Great Plains and Great Basin to about latitude 48° ," excepting of course the areas along the three principal mountain systems occupied by the southward extension of the Boreal Region, as already explained. "To the southward it occupies the great interior basin of Mexico and extends into the tropics along the highlands of the interior," and covers all but the extreme southern part of the peninsula of Lower California (p. 26). The Sonoran Region is divisible "into two principal transcontinental zones (a) *Upper Sonoran*, and (b) *Lower Sonoran*; and each of these may again be subdivided into *arid* and *humid* divisions" (p. 27). The 'humid division' of the Upper Sonoran "comprises the area in the eastern United States commonly known as the Carolinian Fauna," and merges into the 'arid division' of the Upper Sonoran near the 100th meridian. The arid division spreads over the Great Plains, reaching an altitude of about 4000 feet along the eastern foot of the Rocky Mountains in the latitude of Colorado, and extending obliquely northward along the Missouri through North Dakota and into eastern Montana. "Another subdivision of the arid Upper Sonoran occupies the greater part of the Great Basin between the Rocky Mountains and the High Sierra, reaching northerly . . . to and including the plains of the Columbia and Snake Rivers." There is also another area

in the interior basin of California, occupying the valley of the Sacramento and San Joaquin Rivers, and a branch extends along the coast between Monterey and the Santa Barbara plain (p. 30).

The 'humid' division of the Lower Sonoran corresponds to what has been commonly termed the Lousianian Fauna, or the 'Australoriparian' of some writers. "It begins on the Atlantic seaboard at the mouth of the Chesapeake Bay and stretches thence southwesterly, embracing the alluvial lands of the South Atlantic and Gulf States below what geologists know as the 'fall line,' rising in the Mississippi bottom as far as the junction of the Ohio with the Mississippi, and following the former in a narrow strip to the point where it receives the Wabash. On the west side of the Mississippi it crosses Arkansas, reaching southern Missouri and southeastern Kansas, and spreads out over Indian and Oklahoma Territories and Texas, where it loses its moisture and merges insensibly into the arid Sonoran" (p. 28). The 'arid' Lower Sonoran extends thence westerly, "covering southern New Mexico and Arizona south of the plateau rim (sending a tongue up the Rio Grande to a point above Albuquerque), the west side of which it follows northerly to the extreme northwestern corner of Arizona and the southwestern corner of Utah (where it is restricted to the valley of the lower Santa Clara, or St. George Valley), and thence westerly across Nevada, . . . and thence curving southwesterly . . . covers the whole of the Mohave and Colorado Deserts and all the rest of southern California except the mountains." It also includes most of the peninsula of Lower California, and occupies a small area in the San Joaquin and Sacramento Valleys (p. 28). Respecting Lower California he adds: "It is evident, however, that the peculiar fauna of the peninsula of Lower California entitles it to rank as a minor subdivision of the Lower Sonoran Zone. It is in effect an insular fauna of recent origin, bearing the same relation to that of the main land as do several of the adjacent islands" (p. 30).

Between the Boreal and Sonoran Regions Dr. Merriam recognizes what he terms a 'Neutral or Transition Zone,' which has also a humid and an arid division. The former corresponds to what is generally known as the Alleghanian Fauna, while the arid division is its western equivalent. It forms for the most part a pretty broad belt, characterized by the overlapping of boreal and 'Sonoran' types. This 'Transition Zone,' as described in the text and as laid down on the accompanying map, suggests one or two troublesome queries. How, for example, is this 'Transition Zone' to be classified—as a part of the 'Boreal Region' or as a part of the 'Sonoran Region?' or does it belong to neither? If so, what is its status? Obviously, so far as nomenclature goes, it is that of a minor region interposed between, and thus wholly separating, two primary regions! It is apparently co-ordinate in rank with the 'Upper Sonoran' and the 'Lower Sonoran' Zones, respectively, and also with the 'Hudsonian' and 'Canadian' zones. While we are willing to accord it this rank, and are thus in agreement with our author so far as the facts are concerned, we should much

prefer to assign it definitely to one or the other of the contiguous regions, and if called upon to make the assignment we should with little hesitation add it to the so-called 'Sonoran' Region, with which on the whole it seems to be most closely related.

In this connection we would reiterate our protest (see Auk, VIII, p. 98, last part of last paragraph) against the use of the term *transitional* as a specific designation for any faunal area of whatever grade or character. Until nature devises some means of erecting hard and fast barriers abruptly limiting the habitats of animals, there must be between any two contiguous faunal areas a belt of neutral or transitional territory, more or less marked according to circumstances. The Hudsonian Zone, for example, is a 'transition' zone between the Arctic and Canadian, or at least its northern half may be so considered, while the Lower Sonoran Zone is likewise 'transitional' between the Tropical Region and the Upper Sonoran; and so on.

"The Tropical Region reaches the United States at two remote points—Florida and Texas. In the former it exists as a narrow subtropical belt encircling the southern half of the Peninsula from Cape Malabar on the east to Tampa Bay on the west. In Texas it crosses the Lower Rio Grande from Mexico and extends north to the neighborhood of the Nueces River. In western Mexico the Tropical Region reaches Mazatlan" (p. 33).

Dr. Merriam considers his subject especially from the standpoint of mammals, and tabulated lists of the genera and species distinctive of the different zones and life areas are given. Yet his consideration of the subject is by no means limited to this class of animals, but relates as well to plants and land animals in general. After passing in review the special subject of his address, he devotes considerable space to the consideration of general subjects, discussing at some length the influence of the glacial period upon the present character and distribution of life in North America and the origin of its present fauna. He also considers the causes controlling distribution, and emphatically identifies himself with the long list of eminent authorities who believe that the solution of the whole question may be found in climatic conditions. In this connection attention is called to Mr. A. R. Wallace's assumption that temperature has comparatively slight influence upon the distribution of animal and vegetable life, and especially to his various misstatements and erroneous assumptions respecting the distribution of life in North America and the limiting effects of mountain barriers to its distribution. In commenting on the so-called 'Nearctic' and 'Palearctic' Regions of Sclater, he shows that of the 31 'boreal' genera of North American mammals 77 per cent are common to Boreal America and Boreal Eurasia. Facts of similar import are cited in reference to insects. In conclusion Dr. Merriam observes: "I see no reason why a homogeneous circumpolar fauna of great geographic extent should be split up into primary regions possessing comparatively few peculiar types simply because a water separation happens to exist in the present geologic period; nor is it evident why one of the resulting feeble divisions should be

granted higher rank than a region of much less geographic extent comprising several times as many peculiar types. Hence the divisions here recognized, and the rank assigned them, are based as far as possible upon the relative numbers of distinctive types of mammals, birds, reptiles, and plants they contain, with due reference to the steady multiplication of species, genera, and higher groups from the poles toward the tropics."

Dr. Merriam's studies of the life areas of North America have evidently had a wide scope, and have been prosecuted systematically and with great thoroughness. His historical review of what has been done in this field by previous workers, including a collation and tabulation of their results, is alone a most useful and important contribution to the subject, as well as an admirable preparation for further research. His experience in the field also has given him the rare advantage of a personal knowledge of a large part of the area he attempts to treat, and the opportunity of studying on a grand scale the relation of cause and effect in the distribution of animal and vegetable life. Besides possessing great familiarity with the literature of the subject, he has at his command a mass of as yet unpublished details resulting from years of field work on the part of himself and a large corps of collectors and assistants, systematically directed for the express purpose of accumulating data bearing on the distribution of life in North America. With such resources at his command one may well hesitate to criticise his results, as unfolded in his several papers above cited. Yet there are some points we had hoped to see settled that are still left in abeyance, one being a consistent and well-grounded system of nomenclature for the various life areas recognized. Hitherto each writer has adopted such designations as seemed to him most convenient, with little regard to preceding systems and terminology. As we hope soon to treat this phase of the subject somewhat in detail in another connection, we will merely add here that so far as Dr. Merriam's areas are concerned, their boundaries, and in the main their assumed relationships, we are in hearty accord with his results. As regards his classification and nomenclature, we should prefer sundry changes, which, however, may not be in conflict with Dr. Merriam's own views. Evidently he has not thus far attempted to present a systematic scheme of terminology, his designations for different areas being descriptive and provisional rather than the outgrowth of a broad scheme of classification, as regards their relative rank and systematic terminology. — J. A. A.

Suchetet on Hybridity in Birds.—The third part of M. Suchetet's work on 'Hybridity among Birds in a Wild State'* treats of the Passeres, and forms about 280 octavo pages. It shows a vast amount of painstaking

* Les Oiseaux Hybrides | rencontrés a l'état sauvage | par | André Suchetet | — | Troisième Partie | Les Passereaux | — | Extrait des Mémoires de la Société Zoologique de France | Tome V. page 253, année 1892. | — | Lille | Imprimerie typographique et lithographique le Bigot Frères | 68, rue Nationale, et 9-II, rue Nicolas-Leblanc | 1892. — 8vo., pp. 179-451 + i-v.